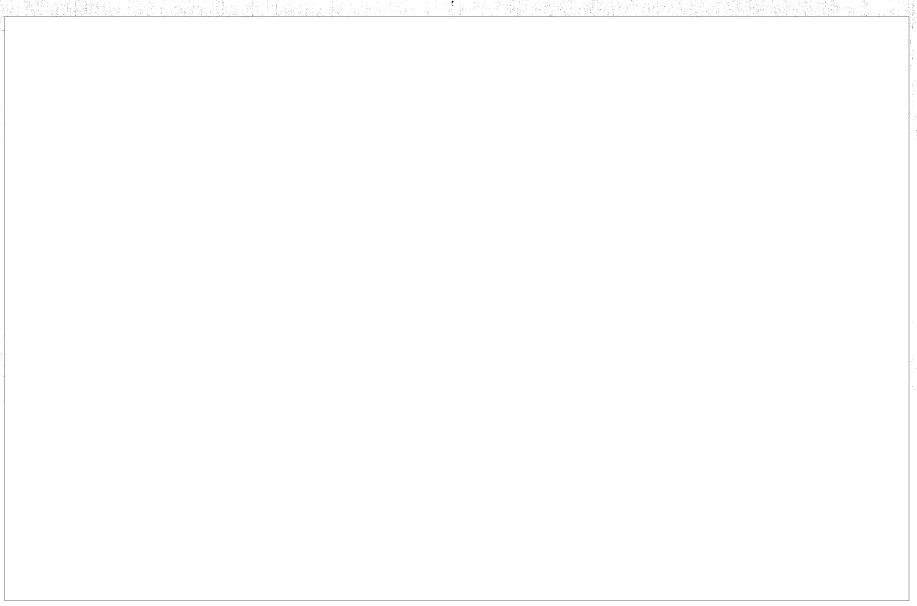
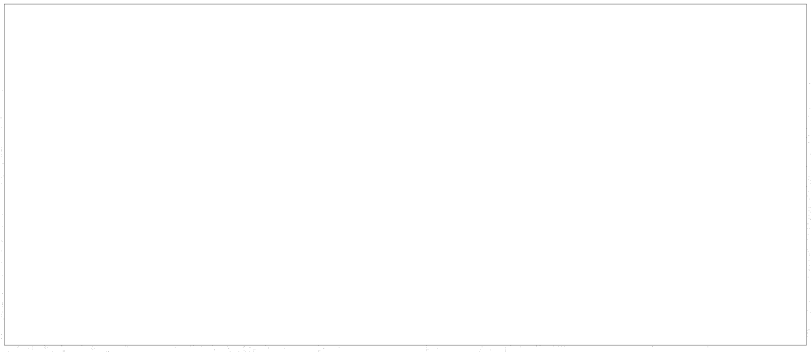


Certain Peculiarities in the Operation of Armament of Tanks and Self-Propelled Artillery Mounts

by Engineer-Lieutenant Colonel P. Kirillin
Tankist, Moscow, No 1, January 1951



SECRET

CERTAIN PECULIARITIES IN THE OPERATION OF ARMAMENT OF TANKS AND SELF-PROPELLED ARTILLERY MOUNTS

by Engineer-Lieutenant Colonel P. Kirillin
(Tankist, No. 1, January, 1951)

The operation of the armament of tanks and self-propelled artillery mounts includes maintenance and storage of artillery systems, and the execution of special measures in order to keep their armament at combat readiness. The mastering, by our troops, of problems relating to the operation and proper organization of artillery systems will make it possible for them to keep armament in serviceable condition and to make effective use of it.

Let us consider certain peculiarities in the operation of artillery systems which affect the combat efficiency of the armament of tanks and self-propelled artillery mounts.

As a rule, field artillery guns are secured while on the march under combat conditions; only after taking up their firing positions are the guns put into firing order. Consequently, while on the march, the aiming devices of these guns are not in use and the life of their parts prolonged thereby. Tanks and self-propelled artillery mounts frequently conduct fire while on the move and consequently, in the majority of cases, keep their aiming devices in operation, which adds to the mechanism's load and shortens the life of its parts. In order to prolong the service life of aiming devices, the working condition of the special shock-absorbing mechanisms of tanks (springs, couplings), and the spring-mounted hulls of military track-laying vehicles must be carefully looked after.

One of the things responsible for the premature malfunctioning of aiming devices is the jarring of the gun barrel, caused by the vehicle encountering obstacles in its path. Such jarring usually leads to serious breakdown, such as shearing the teeth of the elevating mechanism cylindrical gear. Therefore, a mastery of the technique of driving, particularly driving over broken terrain, should be expected of the driver-mechanic. Of even greater importance is the timely elimination and proper repair of defects, the proper assembly, adjustment, and tightening of mechanisms used in tanks and self-propelled

artillery mounts.

The practice of checking on the operation of aiming devices has demonstrated that the basic indices of proper working order, proper assembly, adjustment, and tightening, are smoothness of operation and absence of any increase in the amount of vertical and horizontal play in the tipping or rotating parts of the gun (the barrel included). A check of the extent of this play can best be made with the barrel raised at various angles (to test the elevating mechanism), and with the barrel traversed in various directions (to test the traversing mechanism). An especially careful check should be made of the cylindrical couplings or wormgear, spots where the greatest deformation or wear are liable to occur.

There are two methods of verifying the amount of play: the precise, and the approximate.

Under the precise method, the amount of vertical play is measured with the aid of a quadrant placed on the control surfaces of the gun; the amount of horizontal play may be measured with the aid of the aiming device. Allowances or tolerences for the amount of play are to be found in the proper manuals and in the technical specifications used in repairing the gun.

The second (approximate) method of ascertaining the amount of vertical and horizontal play in the barrel involves measuring the distance of traverse of the muzzle of the gun, both vertically and horizontally, and converting these distances into mils. To determine the distance of traverse of the muzzle, it is traversed to the left and then to the right (to measure the amount of horizontal play), and up and down (to measure the amount of vertical play), so as to fully take up all slack or play in the cylindrical couplings and wormgear.

The conversion of distances of traverse into mils may be accomplished with the use of the formula:

$$a = \frac{h \cdot 1000}{\Pi},$$

with a - the amount of vertical play in the barrel, expressed in mils;

h - the amount of vertical traverse of the muzzle;

Π - the distance from the point of measurement to the axis of the trunnion.

If, as the result of such measurement, an increase is noted in the amount of horizontal and vertical play in the barrel, a disassembly of the gun's mechanisms must be carried out without delay, to eliminate any defects which may have appeared and to restore proper operation. Care must be taken, however, prior to disassembly, that the mechanisms are checked for proper assembly, adjustment, and tightening. This can be done by gripping the muzzle and shaking the barrel vertically and horizontally. Special attention should be devoted to the proper engagement of cradle gear with the cylindrical gear of the elevating mechanism, to the tightening of housings and gear boxes, to the axial play of worm wheels.

Performing such an inspection of mechanisms in their assembled form makes it possible to discover beforehand the basic causes of defects, defects which may be easily uncovered and eliminated once the mechanisms are disassembled. After disassembly of the gun's mechanisms, every worm wheel should be checked for absence of play in the worm wheel rim relative to its hub. This can be done by tapping the rivets; if loose rivets are found, they must be replaced. Such play in the worm wheel rim may also be discovered by clamping the hub in a vise and then attempting to move the worm wheel rim back and forth.

To increase the service life of aiming mechanisms, the working order of the elevating and traversing mechanism brakes should be checked regularly, and the reliability of their locking ability ascertained more often.

Usually, the length of recoil of tank guns, depending upon the particular clearances of the tank turret, is somewhat shorter than the recoil of field artillery guns of the same calibre. The characteristics of the turret also create certain other drawbacks in the inspection and cleaning of the rods and cylinders of the counterrecoil mechanism. A special obligation is thus placed upon the technical crew responsible for disassembly, repair, assembly, and testing of counterrecoil mechanisms, to be particularly careful in their servicing. There should be available for the disassembly, repair, and assembly of counterrecoil mechanisms, a specially equipped room used for that purpose alone. Disassembly and assembly should be performed only on special workstands and benches; cylinders must never be clamped in vises.

The workstands should be low, stable, and handy for carrying out disassembly and assembly. Stands should be equipped with wide clamps for holding cylinders. Cylinders must be clamped only over the piston and should never be clamped over the threading of the replenisher cover and housing.

Instead of workstands with hinged clamps, some ordnance repair shops use clamps without hinges taken from the cradles of training guns. In such cases, care must be taken that the entire cylinder surface within the clamp is fully supported; otherwise, during disassembly, cylinder threads may be sheared, and the counterrecoil mechanism put out of commission.

Where cylinder covers are difficult to remove, the use of a special wrench with strengthened edges is recommended. Before unscrewing the cover, the threaded area should be carefully tapped with a copper punch or copper hammer. To facilitate unscrewing, the faces of the covers should be tapped lightly with a copper hammer.

To prevent corrosion of rods and internal cylinders of the replenishers at points where they come into contact with sealing compounds, troops should perform a periodic cleaning of the rods and cylinders. Such cleaning should be done by a specially instructed squad using hemp rope or a strip of cloth dipped in the liquid used in the cylinder, and sprinkled with pulverized charcoal. Care must be taken when using a hemp rope that the rope contains no metallic parts.

It sometimes happens, in the disassembly of the counterrecoil mechanism, that the cylinders of the replenisher are not completely drained of liquid, and upon reassembly the full quota of liquid is poured back in. Thus, the amount of liquid in the replenisher exceeds the amount called for. To insure the proper filling of recuperator cylinders, the pressure should be tested at two points, as called for by the testing chart.

The escape of liquid from the cylinder during fire may cause a distention of the internal cylinders. A shortage of liquid in the recoil brake may result in the breakdown of piston rods, counterrecoil buffer and other damage, thus putting the gun out of commission.

Assembly of the counterrecoil mechanism must be started immediately after disassembly and repair. It is best not to leave the counterrecoil mechanism

disassembled even overnight, since the liquid drains off the surface of the parts rapidly and they may become corroded.

Prior to assembling the counterrecoil mechanism, the parts must be thoroughly cleaned and dried. Assemblers should wear clean calliee or cotton gloves, since touching parts with the bare hand may cause corrosion. Covers with sheared and nicked threads, particularly those nicked on the first thread, must not be used in reassembly. Nor should damaged copper packing rings be used again or repaired. Counterrecoil devices with threaded covers, should have all threads lubricated with the same liquid used to fill the cylinders.

Tank crews should know the working principles and operation of the armament of their vehicles. A knowledge of their material will assure the proper maintenance of artillery systems, will contribute to the development of a proper technique for cleaning and lubricating gun parts. Every member of the crew, in servicing the vehicle, should know the precise location of gun lubricants and the overall scheme of lubrication.

A gun barrel which is dirty or which has not been cleaned of lubricant should never be allowed to fire because of the danger of dilation or other damage to the gun. Firing a gun with an unclean barrel under winter conditions may result in a bursting of the gun barrel.

The condition of bore surfaces of guns being used under combat conditions must be particularly carefully checked. The barrels of such guns sometime sustain damage from gunshot or shell fragments, with resultant bulges on the surface of the bore. Where possible, the condition of the bore of such guns should be checked with special gauges, or a ~~blank~~ solid round minus its rotating band.

The condition and proper storage of artillery rounds aboard the vehicle should be checked regularly, with particular attention being paid to the rounds' fastenings, the condition of their rubber inserts, safety and arresting devices. If the storage of rounds is improper, shells may fall, dents will appear on the shell casings, and damage to the fuzes will result. All this may cause delay in firing and damage to the barrel of the gun.

Because the presence of turret armoring may make the examination of all

the tipping parts of the gun more difficult, a periodic examination of the cradle trunnions, bearing surfaces, barrel clips and trunnion guides is recommended, with special attention paid to the condition of lubricants and the gun parts themselves. This must be done without waiting for complete disassembly of the gun, partial disassembly being carried out where, and if, necessary.

In disassembling and assembling the gun, its parts must be safeguarded from blows, and the vertical and horizontal traversing locks of the gun kept from being damaged.

Hinged sights should be removed from the vehicle periodically to check their working condition. The presence of any defects in the lenses (the appearance of moisture, disruption of the grid) should be ascertained, and a check made of the appearance and fastenings of the glass of the sight reticules. Sights must again be adjusted after replacement.

* END *